TM 9-4910-409-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

(INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS)

TESTER DIESEL FUEL INJECTOR NOZZLE (BACHARACH INDUSTRIAL INSTRUMENT COMPANY MODEL YFL) (4910-255-8641) WITH CONNECTOR SET 44 (BACHARACH PART NUMBER 65-275) (4910-955-5517) AND CONNECTOR SET (ORD DWG B11020498) (4910-955-5516)

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1963

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Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 25 *June 1973*

Operator and Organizational Maintenance Manual (Including Repair Parts and Special Tool Lists) TESTER, DIESEL FUEL INJECTOR NOZZLE (BACHARACH INDUSTRIAL INSTRUMENT COMPANY MODEL YFL) (4910-255-8641) WITH CONNECTOR SET 44 (BACHARACH PART NUMBER 65-275) (4910-955-5517) AND CONNECTOR SET (ORD DWG B11020498) (4910-955-5516)

TM 9-4910-409-12, 29 October 1963, is changed as follows

Page 2. paragraph 1f is superseded as follows

1f. You can improve this manual by calling attention to errors and by recommending improvements using DA Form 2028 (Recommended Changes to Publications) or by a letter and mailing direct to Commander, US Army Weapons Command, ATTN: AMSWE-MAS-SP, Rock Island IL 61201. A reply will be furnished direct to you.

Page 3. Add the following to paragraph 4: Parts included with the end item and considered as components of the end item configuration are listed in the following table:

Table 0. Components of the End Item

Components	Part No.	(FSCM)	Qty
CASE, CARRYING:	65-808	(05083)	1
CONNECTOR SET, FUEL INJECTOR	11020498	(05083)	1
CUP, COLLECTOR	65-317	(05083)	1
HOSE, PRESSURE, HIGH	65-284	(05083)	1

Page 22. Appendix II is superseded as follows:

APPENDIX II
BASIC ISSUE ITEMS LIST
AND
ITEMS TROOP INSTALLED OR AUTHORIZED LIST

The basic issue items and items troop installed or authorized lists are not applicable.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
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DCSLOG (3)
CNGB (1)
TSG(l)
COE (5)
CONARC (2)
AMC (5)
ARADCOM (2)
ARADCOM Rgn (2)
Armies (3) except
7th USA (5)
8th USA (5)
Corps (2)
OS Maj Comd (2)
LOGCOMD (2)
WECOM (10)
Ft Belvoir (2)
APG(l)
LEAD (2)
LEAD (2)
Instl (2) except
Ft Monmouth (5)
Dir of Trans (1)
USACOMZEUR(l)
Arsenals (1) except
Detroit Arsenal (5)
Units org under fol TOE:
(2 cys each)
7-37
10-500(H-K)
17
29-51
29-56
57

NG: State AG (3)
USAR: None
For explanation of abbreviations used, see AR 310-50.

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Technical Manual
No. 9-4910-409-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *29 October 1963*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS) TESTER, DIESEL FUEL INJECTOR NOZZLE (BACHARACH INDUSTRIAL INSTRUMENT COMPANY MODEL YFL) (4910-255-8641) WITH CONNECTOR SET 44 (BACHARACH PART NUMBER 65-275) (4910-955-5517) AND CONNECTOR SET (ORD DWG B11020498)(4910-955-5516)

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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains instructions on operation and maintenance of the diesel fuel injector nozzle tester for the operator and instructions for organizational maintenance of the nozzle tester by personnel of the using organization.

b. Appendix I contains a list of current references, including supply manuals, forms, technical manuals, and other available publications applicable to the nozzle tester.

c. Appendix II contains a list of equipment and tools which are required by the operator for operating and maintaining the nozzle tester.

d. Appendix III contains the maintenance allocation chart for the nozzle tester listing all maintenance and repair operations authorized for all maintenance echelons.

e. Appendix IV contains a list of repair parts which are required by the using organization for performing organizational maintenance on the nozzle tester.

f. The direct reporting of errors, omissions and recommendations for improving this equipment manual by the individual user, is authorized and encouraged. DA Form 2028 will be used for reporting these improvements. This form may be completed using pencil, pen or typewriter. DA Form 2028 will be completed in triplicate and forwarded by the individual using the manual. The original and one copy will be forwarded direct to:

Commanding General
Headquarters, U. S. Army Weapons Command
ATTN: AMSWE-SMM-TE
Rock Island Arsenal
Rock Island, Illinois 61202

One information copy will be provided to the individual's immediate supervisor (e. g. officer, noncommissioned officer, supervisor, etc.).

2. Maintenance Allocation

a. Operator Maintenance Allocation. The prescribed maintenance to be performed by the operator will apply as reflected in the operator-maintenance (first echelon) column of the maintenance allocation chart (app. III). In all cases, where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the operator, organizational-maintenance personnel should be informed so that trained personnel with suitable tools and equipment may be provided or other instructions issued.

b. Organizational Maintenance Allocation. The prescribed maintenance to be performed by maintenance personnel of the using organization will apply as reflected in the organizational-maintenance (second echelon) column of the maintenance allocation chart (app. III). In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the using organization, the supporting maintenance unit should be informed so that trained personnel with suitable tools and equipment may be provided or other instructions issued.

3. Farms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use, Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be

inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units operating or maintaining this materiel are listed in appendix I. For a listing of all forms, refer to DA Pam 310-2. For instructions on use of these forms, refer to FM 9-3 and TM 38-750.

c. *Equipment Improvement Recommendations. Any* deficiencies detected in the equipment covered herein which occur under the circumstances indicated in AR 750-5, should be immediately reported in accordance with the applicable instructions in cited regulation.

d. Field Report of Accidents. The report necessary to comply with the requirements of the Army safety program are prescribed in detail in AR 385-40. These reports are referenced whenever accidents involving injury to personnel or damage to materiel occur.

Section II. DESCRIPTION AND DATA

4. Description

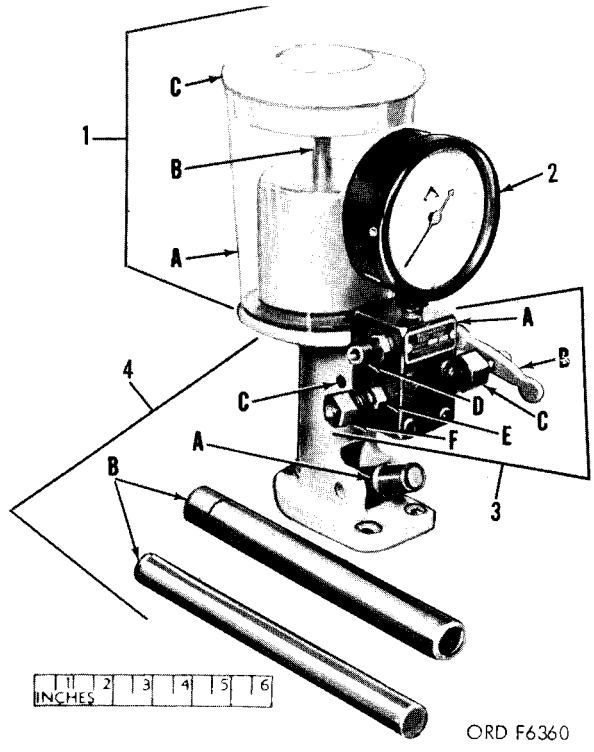
The nozzle tester (fig. 1) is an instrument used for analyzing and testing the accuracy of diesel engine injector nozzles for opening pressure, spray p a t t e r n, chatter, and leakage. It consists of a hydraulic pressure gage, fuel reservoir assembly, discharge block assembly, and body and plunger assembly. The fluid used for testing nozzles is contained in the fuel reservoir assembly. The flow of the fluid is maintained by the pressure developed through the action of the body and plunger assembly and is controlled by the discharge block assembly, The pressure developed during the various tests is indicated on the hydraulic pressure gage. The nozzle tester is contained in a metal carrying case with all necessary accessories, equipment, and instruction handbook.

5. Data Plate

The nozzle tester has one data plate (3A, fig. 1) which is located on the discharge block assembly (3, fig, 1). This plate specifies the manufacturer's name, address, and code number.

6. Tabulated Data

Manufacturer	Bacharach Industrial Instrument Company
Model	YFL
Length	12 in.
Width	10 in.
Height	7-1/2 in.
Cubage (w/equipment) packaged	.999 tuft
Weight (w/equipment) packaged	.24lb



l–Fuel reservoir assembly
A–Fuel reservoir
B–Center rod assembly
C–Fuel reservoir cover
2–Hydraulic pressure gage
3–Discharge block assembly
A–Data plate
B–Valve handle
C–Hydraulic pressure gage valve assembly
D–Upper discharge outlet
E–Lower discharge outlet
F–Cap nut assembly
4–Body and plunger assembly
A–Handle shoe
B–Pump handle assembly
C–Vent screw

Figure 1. Nozzle tester.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

7. Purpose

a. When a new or reconditioned nozzle tester is first received, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its function. For this purpose, inspect all assemblies and parts to be sure they are properly assembled, secured, cleaned, adjusted, and/or lubricated.

b. Make a record of any missing parts, tools, and/or equipment, and any malfunctions. Correct any deficiencies as quickly as possible.

8. Services

a. Unpacking and Checking. Pry off the top of the exterior container and turn the container upside down letting the nozzle tester slide out of the container, Remove the barrier material enveloping the nozzle tester and all cushioning materials, seals, and wrappings from the case of the nozzle tester, also, all equipment stored in the case. Check all equipment with the listing in appendix II to be sure every item is present and in good condition.

b. Cleaning. Remove all preserving materials and clean all parts of the nozzle tester, and equipment as prescribed in paragraph 23.

c. Lubrication. The nozzle tester requires no lubrication.

d. Inspection.

(1) Perform a general inspection of the nozzle tester to assure that all parts are properly and securely assembled and in good condition (par. *22 b).*

(2) Perform the preventive-maintenance services as prescribed in table I, paragraph 24.

(3) Operate the nozzle tester (pars. 15 and 16) and check to see if the components are functioning properly by checking such items as hydraulic pressure gage, body and plunger assembly, etc.

Section II. CONTROLS, INSTRUMENTS, AND RELATED ITEMS

Note: The key numbers shown below in parentheses in this section refer to figure 1 except where otherwise indicated.

9. General

This section describes, illustrates, and furnishes the operator with sufficient information pertaining to the various controls, instruments, and related items for the proper operation of the nozzle tester.

10. Fuel Reservoir Assembly

The fuel reservoir (1A) contains the test fluid used to conduct tests when checking the performance of fuel injector nozzles; The fuel reservoir has a built in paper type filter element (2D, fig. 3). The test fluid is forced through the filter element by atmospheric pressure and pump suction.

11. Hydraulic Pressure Gage Valve Assembly

The hydraulic pressure gage valve assembly (3C) stops the flow of the test fluid to the hydraulic pressure gage. Turn the valve handle (3B) left to open and right to close.

12. Hydraulic Pressure Gage

The hydraulic pressure gage (2) indicates the amount of pressure applied when testing the various types of nozzles. The dial has a range of O to 5,000 psi (pounds per square inch) and marked in increments of 50 psi.

13. Pump Handle Assembly and Handle Shoe

The action of the pump handle assembly (4B) and handle shoe (4A) actuates the plunger built within the body and plunger assembly (4), and producing a hydraulic pressure which is recorded on the hydraulic pressure gage (2).

Section III. OPERATION

Note: The key numbers shown below in parentheses in this section refer to figure 1.

14. General

This section contains instructions for the operation of the nozzle tester under conditions of moderate temperatures and humidity. Every organization equipped with this item must thoroughly train its personnel in the procedures for operating this item.

15. Preparation for Operation

a. Mount the nozzle tester (fig. 1) on a bench and secure with three 3/8-inch bolts, washers, and nuts. For portable use, mount on wooden or metal base 5 inches wide x 15 inches long. Use 3/4-inch plywood or l/2-inch sheet steel.

b. Slide the pump handle assembly (4B) onto the handle shoe (4A) located in the base of the nozzle tester. Solid shaft in the pump handle assembly may be extended or telescoped, depending on 1 e v e r a g e required.

c. Remove the fuel reservoir cover (lC) from the fuel reservoir (1A) with a combined twisting and pulling motion. Fill the fuel reservoir with test fluid and install the fuel reservoir cover.

d. Open the valve handle (3B) and make several strokes with the pump handle assembly (4B) to prime the nozzle tester. Close the valve handle.

Note. A vent screw (4C) is located on the side of the housing behind the lower discharge outlet (3E) and can be opened for thorough venting and priming if necessary.

16. Operation

a. Discharge Block Assembly. The discharge block assembly (3) has two discharge outlets to facilitate the various tests. When nozzle under test is connected to lower discharge outlet (3E) and with hydraulic pressure gage valve assembly (3C) closed, this shuts off and protects the hydraulic pressure gage (2) during rapid and prolonged pumping periods when flushing nozzle or observing spray form. Using upper discharge outlet (3D) and closing hydraulic pressure gage valve assembly (3C) isolates hydraulic pressure gage (2) and the nozzle under test from the nozzle tester (fig. 1) permitting leakage rates or pressure drop measurement tests.

Note. Install and tighten cap nut assembly (3F) on discharge outlet not in use.

b. Mounting Instructions. Mount the fuel injector nozzle to be tested on the nozzle tester in accordance with the connecting instructions (fig. 2) using connector set 4910-955-5517 (1, fig. 6).

Note. Connector set 4910-955-5516 (2, fig. 6) is connected in a similar manner as connector set 4910-955-5517 (1, fig. 6).

c. Testing Nozzles.

(1) *General.* For the v a r i o us tests, connect the nozzle to the discharge outlets, as prescribed in (2), (3), (4) and (5) below. Use the spray collector cup (2, fig. 5) for catching the test fluid. For best results, tip of nozzle should be well centered in the cup.

Warning: **Be careful of the penetrating power of the atomized test fluid under pressure as it is sufficient to puncture the skin permitting test fluid to enter wound and**

INSTRUCTIONS

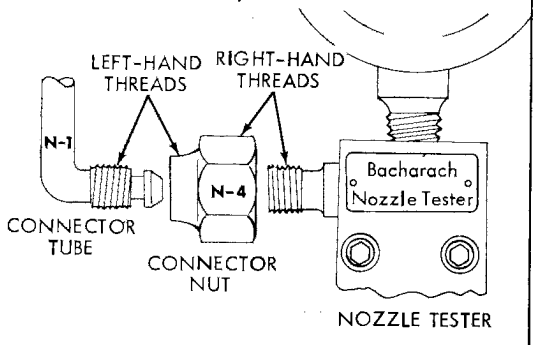
CONNECTOR SET 44

BACHARACH PART NO. 65-275

A

Start CONNECTOR NUT N-4, using round end, on CONNECTOR TUBE N-1.

Hold CONNECTOR TUBE N-1 in desired position and screw CONNECTOR NUT N-4 on discharge connection of NOZZLE TESTER; tighten securely.

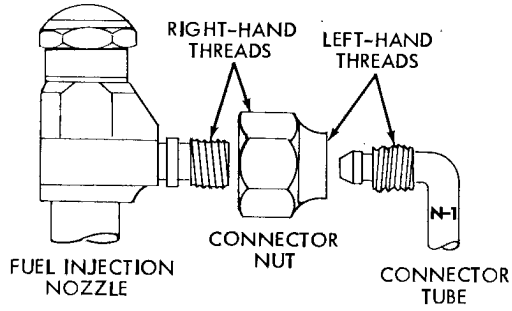


Attaching CONNECTOR TUBE N-1 to NOZZLE TESTER

B

Select proper CONNECTOR NUT for FUEL INJECTION NOZZLE to be tested; engage CONNECTOR NUT (round end) not more than one turn on CONNECTOR TUBE N-1.

Hold FUEL INJECTION NOZZLE inlet threads to hex end of CONNECTOR NUT and screw on CONNECTOR NUT, tightening securely.



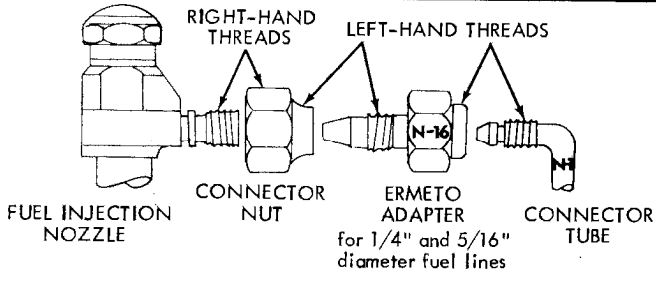
FUEL INJECTION NOZZLE CONNECTION with 60° Cone Seat

THIS CONNECTOR SET CONTAINS:

	Connector Nuts				Connector Tube	Ermeto Adapter
No.	N-4(2)	N-5	N-7	N-8	N-1	N-16
Size	12 x 1.5 MM	14 x 1.5 MM	9/16" x 18	5/8" x 18	60° Swaged Ends	Adapts tube for Ermeto Seat

This connector set, composed of the items listed above, simplifies test connection between the injector to be tested and the Bacharach Nozzle Tester. For proper use of the various fittings see detailed instructions for A, B, and C.

C



FUEL INJECTION NOZZLE CONNECTION with ERMETO SEAT

Screw round end of ERMETO ADAPTER N-16 on CONNECTOR TUBE N-1 as indicated in exploded view and tighten; select proper CONNECTOR NUT for FUEL INJECTION NOZZLE to be tested and engage CONNECTOR NUT not more than one turn on tapered end of ERMETO ADAPTER N-16.

Hold FUEL INJECTION NOZZLE inlet threads to hex end of CONNECTOR NUT and screw on CONNECTOR NUT, tightening securely.

ORD F6361

Figure 2. Connecting instructions.

may cause blood poisoning. Keep hands free of spray at all times.

(2) Opening Pressure. Use lower discharge outlet (3E). Open the hydraulic pressure gage valve assembly (3C), operate the pump handle assembly (4B) slowly and, when nozzle begins to spray test fluid, observe the pressure indicated on the hydraulic pressure gage (2). This pressure should be compared with that specified by the engine manufacturer and nozzle adjusted, if necessary, before proceeding with further testing. Test should be repeated several times to be certain that nozzle consistently opens at the same pressure each time.

(3) Spray Pattern. Use lower discharge outlet (3E). Close the hydraulic pressure gage valve assembly (3C) and operate the pump handle assembly (4B) at approximately 15 strokes per minute. Make sure that all spray holes are open and are spraying the same amount of test fluid. The spray formation should be sharp with a rather solid pattern and the angles formed by the individual sprays should be uniform. A missing section or uneven spray pattern indicates clogged or eroded orifices. Sample spray patterns are generally shown in the engine manual.

(4) *Chatter.* Use lower discharge outlet (3E). Close the hydraulic pressure gage valve assembly (3C) and operate the pump handle assembly (4B) approximately two seconds. The nozzle chatter must be distinct and regular. A sharp pitch sound is not mandatory, and an occasional skip or variation in the chatter sound pitch is acceptable. When nozzle chatter is not satisfactory and does not improve with continued operation of the pump handle assembly, replace the nozzle.

(5) *Leakage.* Use lower discharge outlet (3E). Open the hydraulic pressure gage valve assembly (3C) and opera t e pump handle assembly (4B). During prolonged pumping, drops of test fluid should not form at tip of the nozzle. A second check for leakage can be made by maintaining pressure just below opening pressure and checking for test fluid leakage from tip. If this test is to be used, reconnect nozzle to upper discharge outlet (3D) and close the hydraulic pressure gage valve assembly (3C) to time pressure drop. Some manufacturers specify permissible leakage rates.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, AND EQUIPMENT

17. General

Repair parts, tools, and equipment are issued to the operator for operating and maintaining the nozzle tester. Tools and equipment should not be used for Purposes other than prescribed and when not in use should be properly stored.

18. Repair Parts

No repair parts are supplied to the operator for replacement of those already on the nozzle tester.

19. Common Tools and Equipment

Common tools and equipment having general application to this materiel are authorized by tables of allowances and tables of organization and equipment.

20. Special Tools and Equipment

No tools specially designed for operation or operator maintenance are supplied or required for the nozzle tester. Equipment supplied is listed in appendix II, which is the authority for requisitioning replacement.

Section II. LUBRICATION

21. Lubrication

No lubrication is required on the nozzle tester.

Section III. PREVENTIVE-MAINTENANCE SERVICES

22. General

a. Responsibility and Intervals. The primary function of preventive maintenance is to prevent breakdown and, therefore, the need for repair. These services consist generally of before operation and after-operation services performed by the operator. Intervals are based on normal operations, Reduce intervals for abnormal operations or severe conditions. Intervals during inactive periods may be extended accordingly.

b. Definition of Terms. The general inspection of each item applies also to any supporting member or connection and is generally a check to see whether the item is in good condition, correctly assembled, secure and not excessively worn:

(1) The inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond serviceable limits by the following not bent or twisted, not chafed or burred, not broken or cracked, n o t bare or frayed, not dented or collapsed, not torn or cut, not deteriorated.

(2) The inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to see whether it is in its normal assembled position.

(3) Inspection of a unit to determine if it is "secure" is usually an external visual examination or an examination by hand or wrench for looseness. Such an examination must include any brackets, lockwashers,

lock nuts, locking wires, or cotter pins used.

(4) By "excessively worn" is me ant worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection.

23. Cleaning

a.. General. Any special cleaning instructions required for specific components or parts are contained in the pertinent section. Cleaning instructions are as outlined in (1) and (2) below. General cleaning precautions are contained in *b* below.

(1) *Metal parts.*

(a) Use self-emulsifying decreasing solvent compound, mineral spirits paint thinner, or dry-cleaning solvent (Stoddard) to clean or wash grease or oil from all metal parts of the nozzle tester.

(b) Use clean water or a solution of either 1/4 pound of soap chips or six ounces of painted-surface detergent to one gallon of hot water for all parts and overall general cleaning of painted surfaces.

(c) After parts are clean, dry them thoroughly. Apply a light film of special preservative lubricating oil to all parts having a polished surface to prevent misting.

(d) Before installing new parts, remove any rust-preventive compound, protective grease, etc.

(2) Rubber Parts Other Than Electrical. Clean rubber parts with soap and warm water. Apply a coating of powdered technical talcum to preserve the rubber.

b. General Precautions in Cleaning.

(1) Self-emulsifying decreasing solvent compound, mineral spirits paint thinner, and dry-cleaning solvent are flammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used Use only in well-ventilated places. These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.

(2) Avoid getting petroleum products, such as mineral spirits paint thinner, dry-cleaning solvent, engine fuels, or lubricants, on rubber parts, as they will deteriorate the rubber.

(3) The use of Diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

c. Rust Removal. Remove rust or corrosion from all parts of the materiel. To remove rust or corrosion from unfinished surf aces, use steel cleaning brushes or abrasive cloth. On finished surfaces, other than highly polished surfaces, remove rust or corrosion by buffing with a rotary wheel wire brush constructed of steel wire between 0.010 and 0.025 inch in diameter. Crocus cloth may be used manually to remove rust or corrosion from polished surfaces.

24. Operator's Preventive-Maintenance Services

a. Purpose. To insure efficient operation, it is necessary that the nozzle tester be systematically inspected at intervals each day it is operated so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. The correction of any defect or unsatisfactory operating characteristics beyond the scope of the operator must be reported at the earliest opportunity to organizational maintenance personnel for correction (pars. 33 through 41).

b. Services. Operator's preventive-maintenance services are listed in table I. Every operator equipped with the nozzle tester must be thoroughly familiar with maintenance procedures for this materiel.

Table I. Preventive Maintenance Checks and Services

1st Echelon — *Daily Schedule*

Interval & seq. No.		Item to be inspected	Procedure	Paragraph reference
Before operation	After operation			
1	7	Nozzle tester	& Clean hydraulic pressure gage by wiping dirt and other foreign matter from ridges and surface of gage face.	Par. 23 see fig. 1
2	8	----------	*b.* Clean accumulation of dirt and other foreign matter from outside surface of the fuel reservoir assembly.	Par. 23 see fig. 3
3	9	----------	c. Clean the accumulation of dirt and other foreign matter from interior surfaces of the body and plunger assembly at point of handle entrance in handle shoe.	Par. 23 see fig. 3
	10	----------	Inspect painted surfaces for chips, peeling, and other such defects. Notify organizational maintenance personnel if surfaces require refinishing.	
	11	Equipment --	*a.* Wipe dirt or other foreign matter from inside and outside of carrying case.	See fig. 5
	12	----------	*b.* Straighten distorted or bent fasteners and aline with catches on cover of carrying case.	See fig. 5
4	13	----------	*c.* Clean accumulation of dirt and other foreign matter from high pressure hose.	Par. 23 see fig. 5
5	14	----------	*d.* Clean accumulation of dirt and other foreign matter from all components of the connector sets and replace on the mounting plates.	See fig. 6
6	15	----------	*e.* Clean accumulation of dirt and other foreign matter from the spray collector cup.	*Par. 23 see* fig. 5
	16	----------	*f.* Store all equipment in carrying case,	See fig. 5

Section IV. TROUBLESHOOTING

25. Purpose

Troubleshooting is a systematic determination of malfunctions and defective components by indications, symptoms, and tests. Close adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the materiel to normal operation.

Caution: Operation of the nozzle tester without preliminary examination can cause further damage to a disabled component. Be careful during inspection and troubleshooting, so that damage can be avoided.

26. Scope

This section covers troubleshooting

which is peculiar to the operator's (first echelon) maintenance operations.

27. Procedure

Malfunctions which may occur with the nozzle tester are listed in table II. Upon observing any one of these malfunctions, take immediate steps to locate and correct the cause. Causes are listed opposite each malfunction and are arranged according to the ease of correction.

Table II. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Test fluid starvation.	----------	a. Refer malfunction to organizational maintenance personnel for correction.
2. Unable to build up hydraulic pressure on hydraulic pressure gage (2, fig. 1).	a. Hydraulic pressure gage not threaded tightly into discharge block sub-assembly	*a.* Tighten hydraulic pressure gage farther into discharge block subassembly (fig. 4).
	Gage valve assembly not threaded tightly into discharge block sub-assembly	*b.* Tighten gage valve assembly farther into discharge block sub-assembly (fig. 4).
	c. Socket head cap screws loose in discharge block sub-assembly.	*c.* Tighten socket head cap screws farther into discharge block sub-assembly (4, fig. 3).
	d. Loose connection to either the upper or lower discharge outlet (3-D, and 3-E, fig. 1) 01 cap nut assembly (3-F, fig. 1), not tight on discharge outlet not in use.	*d.* Tighten connection and cap nut assembly on discharge outlets.
	e. Other causes --	*e.* Refer other causes to organizational maintenance personnel for correction.
3. Indications of test fluid leakage at plunger of body and plunger (1-A, fig. 3).	----------	Refer malfunction to organizational maintenance personnel for correction.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, TOOLS, AND EQUIPMENT

28. General

Repair parts, tools, and equipment over and above those available of the operator are supplied by the using organization for maintaining the nozzle tester. Tools and equipment should be properly stored when not in use.

29. Repair Parts

Repair parts are supplied to the using organization for replacement of those parts most likely to become worn, broken, or otherwise unserviceable, provided that replacement of these parts is within the scope of organizational maintenance functions. Repair parts supplied for organizational maintenance of the nozzle tester are listed in appendix IV.

30. Common Tools and Equipment

Common tools and equipment having general application of this materiel are authorized by tables of allowances and tables of organization and equipment.

31. Special Tools and Equipment

No tools or equipment specially designed for organizational maintenance are supplied or required for the nozzle tester.

Section II. PAINTING

32. Painting

Instructions for the preparation of the materiel for painting, methods of painting, as well as a list of materials to be used are contained in TM 9-213. Materials for painting are listed in appendix IV.

Section III. PREVENTIVE-MAINTENANCE SERVICE

33. General

Refer to section III of chapter 3 for preventive-maintenance services for the operator. These instructions apply equally to maintenance personnel of the using organization.

34. Organizational Preventive-Maintenance Services

No further preventive-maintenance services beyond that prescribed for the operator is required of maintenance personnel of the using organization.

Section IV. TROUBLESHOOTING

35. Purpose

Troubleshooting is a systematic determination of malfunctions and defective components by indications, symptoms, and tests. Close Adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the materiel to normal operation.

Caution: Operation of materiel without a preliminary examination can cause fur-

ther damage to a disabled component. Be careful during inspection and troubleshooting, so that damage can be avoided.

36. Scope

This section covers troubleshooting which is peculiar to organizational (second echelon) maintenance operations. For troubleshooting procedures performed by the operator, see paragraphs 25 through 27.

37. Procedure

Malfunctions which may occur with the nozzle tester are listed in tables II and III. In effect, table III is the continuation of table II, paragraph 27. Causes are listed opposite each malfunction and are arranged according to the ease of correction.

Table III. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Test fluid starvation	*a.* Filter element dirty or plugged up.	*a.* Replace filter element (par. 39).
	b. Leaking O-rings, seal, or gaskets of filter assembly.	*b.* Discard old O-rings, seal, or gaskets and replace with new parts (par. 39).
	c. Other causes --	*c.* Refer other causes to field maintenance e personnel for correction.
2. Unable to build up hydraulic pressure on hydraulic pressure gage (2, fig. 1).	*a.* Defective gasket on gage valve assembly.	*a.* Discard old gasket and replace with new gasket (par. 41).
	b. Dirt accumulation in discharge block assembly.	*b.* Clean dirt from discharge block assembly (2, fig. 4).
	c. Defective valve gasket or O-ring in discharge block assembly.	*c.* Discard old valve gasket and O-ring and replace with new gasket and O-ring (par. 41).
	d. Scratched or scored valve seat.	*d.* Replace valve seat (par. 41).
	e. Defective hydraulic pressure gage.	*e.* Replace with new hydraulic pressure gage (par. 41).
	f. Other causes --	*f.* Refer other causes to field maintenance personnel for correction.
3. Indications of test fluid leakage at plunger of body and plunger (1-A, fig. 3).	----------	Refer malfunction to field maintenance personnel for correction.

Section V. FUEL RESERVOIR ASSEMBLY

Note. The key numbers shown below in parentheses in this section refer to figure 3.

38. Description

The fuel reservoir assembly (2) is mounted on t o p of the body and plunger assembly (1) and consists primarily of a reservoir (2B), cover (2J), center rod assembly (2G), and filter element (2D). The reservoir assembly can be removed from the body and plunger assembly by taking the cover off the reservoir and unscrewing the center rod assembly. Test fluid used for testing the performance of fuel injector nozzles is stored in the reservoir. The fluid is forced through the filter element to remove impurities.

39. Maintenance

a. General. Organizational personnel has the authorization for the complete maintenance of the fuel reservoir assembly to the extent of removing, disassembling for inspection and replacement of all unserviceable components, and the final steps of assembling and installing the assembly.

b. Disassembly. Remove the cover (2J) from the reservoir (2B) by using a combined twisting and pulling motion. Unscrew the center rod assembly (2G) from the body and plunger assembly (1) and remove the O-ring (2H). Slide the filter element (2D), filter washer (2E), and filter spring (2F) off the center rod assembly (2G). Remove the upper and lower filter gaskets (2C) from the filter element. Remove the reservoir (2B) from the body and plunger assembly (1) and the seal (2A) from the reservoir.

c. Cleaning. Clean the parts thoroughly with an appropriate solvent (par. 23).

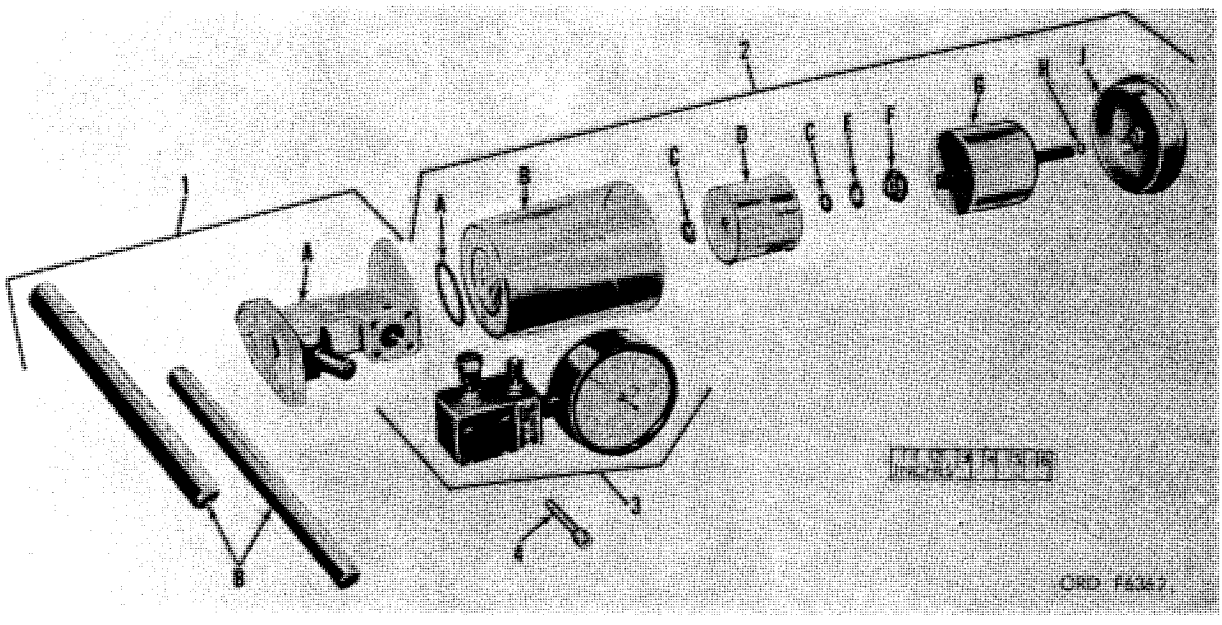
d. Inspection and Repair.

(1) inspect the cover (2J), O-ring (2H), reservoir (2B), center rod assembly (2G), filter spring (2F), filter washer (2E), upper and lower gaskets (2C), and seal (2A) for being in good condition (par. 22b).

(2) Replace with new, the filter element (2D) and all other parts determined not in good condition.

e. *Assembly.* Install the seal (2A) on the bottom of the reservoir (2B) and mount the reservoir on top of the body and plunger assembly (1). Slide the filter spring (2F), filter washer (2 E), and O-ring (2H) onto the center rod assembly (2G). Place the upper and lower gaskets (2C) on the filter element (2D) and slide the filter element onto the center rod assembly (2G). Screw the center rod assembly into the body and plunger assembly (1). Install the cover (2J) on the reservoir (2B).

Note. One end of the filter element is red and marked "top". Be sure the element is installed with this end in the upward position.



1 - Body and plunger assembly
A–Body and plunger
B–Handle
2 - Fuel reservoir assembly
A - Seal
B - Reservoir
C - Upper and lower gasket
D - Filter element
E - Filter washer
F - Filter spring
G - Center rod assembly
H - O-ring
J - Cover
3 - Discharge block assembly and hydraulic pressure gage
4 - Socket head cap screw

Figure 3. Fuel reservoir assembly,

Section VI. DISCHARGE BLOCK ASSEMBLY AND HYDRAULIC PRESSURE GAGE

Note. The key numbers shown below in parentheses in this section refer to figure 4 except where otherwise indicated."

40. Description

The discharge block assembly and hydraulic pressure gage (3, fig. 3) is mounted on the front of the body and plunger assembly (1, fig. 3) and can be removed by unscrewing four socket head cap screws (4, fig. 3). It consists primarily of a cap nut assembly (2E), discharge block sub-assembly (2F), gage valve assembly (2H) with handle (2J), filler rod assembly (2B), valve seat (2C), and hydraulic pressure gage (1). The flow of test fluid from the reservoir assembly (2, fig. 3) is controlled by the discharge block assembly by opening and closing the gage valve assembly (2H).

41. Maintenance

a. General. Organizational personnel has the authorization for the complete maintenance of the discharge block assembly and hydraulic pressure gage to the extent of removing, disassembling for inspection and replacement of all unserviceable components, and the final steps of assembling and installing the assembly and gage.

h. Removal. Unscrew the four socket head cap screws (4, fig. 3) and remove the discharge block assembly and hydraulic pressure gage (3, fig. 3) from the body and plunger assembly (1, fig. 3).

c. *Disassembly.* Remove the hydraulic pressure gage (1) by unscrewing it from the discharge block sub-assembly (2F). Unscrew the gage valve assembly (2H) with handle (2J) and remove the gasket (2G). Remove the cap nut assembly (2E), valve gaskets (2A), filler rod assembly (2B), and valve seat (2C) from the discharge block sub-assembly (2F). Remove the valve O-ring (2D) from the valve seat (2C).

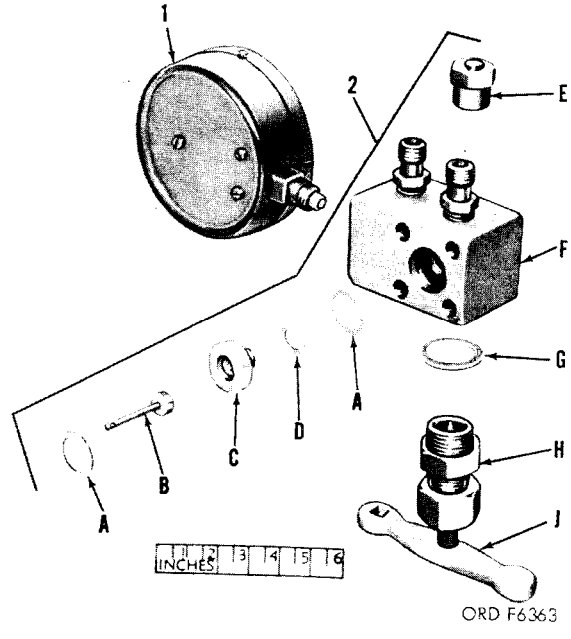
d. Cleaning. Clean the parts thoroughly with an appropriate solvent (par. 23).

e. Inspection and Repair.

(1) Inspect the filler rod assembly (2B), valve seat (2C), gaskets (2A and 2G), cap nut assembly (2 E), and gage valve assembly (2H) for being in good condition (par. 22b).

(2) Replace with new the valve O-ring (2D) and all other parts determined not in good condition.

f. Assembly. Screw the cap nut assembly (2E) onto the discharge block sub-assembly (2 F). Place the valve O-ring (2D) on the valve seat (2C). Install the valve gasket (2A), valve seat (2C), filler rod assembly (2B) and valve gasket (2A) in the discharge block sub-assembly (2F). Place the gasket (2G) on the gage valve assembly (2H) and screw the gage valve assembly into the discharge block sub-assembly. Screw the hydraulic pressure gage (1) into the discharge block sub-assembly. Install the discharge block assembly and hydraulic pressure gage (3, fig. 3) on the body and plunger assembly (1, fig. 3) and secure in place with the four socket head cap screws (4, fig. 3).



1–Hydraulic pressure gage
2–Discharge block assembly
A–Valve gasket
B–Filler rod assembly
C–Valve seat
D–Valve O-ring
E–Cap nut assembly
F–Discharge block sub-assembly
G–Gasket
H–Gage valve assembly
J–Handle

Figure 4.. Discharge block assembly and hydraulic pressure gage.

CHAPTER 5

SHIPMENT AND ADMINISTRATIVE STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND ADMINISTRATIVE STORAGE

42. Shipping Instructions

a. Responsibility. When shipping the nozzle tester, the unit commander will be responsible for shipping the materiel, including all tools and equipment, adequately processed, packaged, and packed to protect it from damage until it reaches the echelon of maintenance for required repairs; or, in the case of troop movement, reaches its destination in a serviceable condition.

b. Army Shipping Documents. Prepare all army shipping documents in accordance with AR 725-50.

c. Preparation for Shipment. When the nozzle tester is removed from administrative storage for shipment it need not be reprocessed unless inspection reveals it to be inadequately preserved, or when it is necessary because of anticipated in-transit weather or shipping conditions. Preservatives must not be removed or disturbed, except as necessary, to insure that the nozzle tester is complete and serviceable. If preservatives are removed, they must be restored prior to shipment.

43. Preservation, Packaging, Pocking, and Marking Instructions.

a. Preservation and Packaging. Preservation of the nozzle tester must be sufficient to protect it against deterioration and damage during shipment and administrative storage and/or the subsequent interval prior to use. Under no condition will tools and equipment with critical surfaces be packaged without benefit of sufficient preservation to assure adequate protection (TM 9-200). Preservation and packaging must be compatible with end use requirements.

b. Packing. Packed items must be acceptable to the carrier, while affording adequate protection to the items during shipment and administrative storage and/or the subsequent interval prior to use.

c. *Marking.* All materiel will be marked in accordance with TM 9-200.

44. Administrative Storage

a. General.

(1) Unit commander? may, with the approval of major commanders, place the nozzle tester in administrative storage or return to supply agencies equipment that is beyond the maintenance capability of the unit. Nozzle testers must be stored in the most favorable 10 cation available, preferable one which affords protection from exposure to elements and pilferage.

(2) All nozzle testers in administrative storage must be maintained so that they will be ready for immediate use and/or ready for shipment.

(3) Administrative storage is restricted to a period of 90 days and must not be extended unless the nozzle tester is reprocessed.

b. Storage Procedures.

(1) Perform a quarterly preventive-maintenance (PM) service on the nozzle tester. This maintenance will consist of inspecting, cleaning, servicing, and preserving, as required, and will also include minor repair parts replacement (if required) not requiring highly technical skills or expensive, complicated, or bulky test equipment or tools.

(2) Provide access to the nozzle tester to permit inspection, servicing, and removal from storage.

(3) Mark the nozzle tester "Administrative Storage" (by use of tags or

other convenient method). The noz - zle tester so marked must not be operated while in this category.

c. Inspection in Administrative Storage. Visual inspection of the nozzle tester in administrative storage must be conducted at least once each month to detect corrosion and rust, When corrosion and rust are found, corrective action must be taken immediately. A record of these inspections must be maintained for each nozzle tester in administrative storage. The records must be attached to the nozzle tester in such a manner as to protect it from the elements.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

45. General

a. Destruction of the nozzle tester, when subject to capture or abandonment in the combat zone, will be undertaken by the using army only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by, the army commander. When in the hands of maintenance personnel or in storage, destruction will be in accordance with FM 9-5 and the information below, when applicable.

b. The information which follows is for guidance only. Certain phases of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials and the conditions under which destruction will be effected are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are:

Mechanical . . . . Requires axe, pick mattock, sledge, crowbar, or similar implement.

Burning . . . . . Requires gasoline, oil, incendiary grenades, or other flammables, welding or cutting torch.

Disposal . . . . . Requires burying in the ground, dumping in streams or marshes, or scattering so widely as to preclude recovery of essential parts.

*Demolition . . . Requires suitable explosive or ammunition.

*Gunfire . . . . , Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. U n de r some circumstances, hand grenades may be used.

In general, destruction of essential parts, followed by burning, will usually be sufficient to render the material useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction required that all parts essential to the operation of the materiel be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel, so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

***Generally applicable only when nozzle tester is to be destroyed in conjunction with other equipment.**

46. Destruction of the Nozzle Tester

a. Method No. 1 - Destruction by Mechanical Means.

(1) Open the carrying case and remove the nozzle tester, connector sets, hose, and spray collector cup.

(2) Using an axe, pick mattox, sledge, or any other heavy implement, destroy the nozzle tester by smashing the body casting, fluid reservoir, and hydraulic gage,

(3) Destroy the carrying case and spray collector cup by smashing. Cut the hose in short lengths, and scatter the connector sets.

Elapsed time: about 2 minutes.

b. Method No. 2- Destruction by Burning,

(1) Open the carrying case and remove the nozzle tester, connector sets, hose, and spray collector cup.

(2) Using a welding or cutting torch, burn through the body casting, fluid reservoir, hydraulic gage, carrying case, spray collector cup, hose, and connector sets.

(3) In the absence of a welding or cutting torch, place piles of combustible materiel on and about the nozzle tester. Pour gasoline or oil over the combustible materiel and the nozzle tester, ignite by means of an incendiary grenade fired from a safe distance, by a combustible train of suitable length, or other appropriate means. Take cover immediately. A hot fire is required to render the materiel useless.

Elapsed time: about 4 minutes.

Warning: **When igniting gasoline, due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in fatal or painful burns.**

c. Method No. 3- Destruction by Disposal. Bury the nozzle tester in a suitable hole or throw it into a stream.

Elapsed time: about 2 minutes.

APPENDIX I

REFERENCES

1. General

a. Military Publications. The packaging publications listed herein are available to activities requiring such publications. Forward requests for Military Specifications to Naval Supply Depot, 5801 Tab or Avenue, Philadelphia, Pennsylvania. Requisition technical manuals, technical bulletins, supply bulletins, and other publications indexed in 310 series DA pamphlets in accordance with AR 310-1.

b. Commercial Publications. Commercial publications listed herein may be obtained from the following addresses: Uniform Freight Classification Rule and Containers Specifications for Rail Shipment; Uniform Classification Committee, 202 Union Station, Chicago 6, Illinois; National Motor Freight Classification Rules and Container Specifications for Truck Shipment; American Trucking Association, 1424 16th Street, N. W., Washington 6, D.C.

2. Army Regulations

Issue of Supplies and Equipment: Requisitioning, Receipt, and Issue System. . . . . AR 725-50
Logistics (General): Report of Damaged or Improper Shipment . . . . . AR 700-58
Maintenance of Supplies and Equipment: Organizational Policies, and Responsibilities for Maintenance Operations. . . . . AR 750-5
Military Publications: General Policies. . . . . AR 310-1
Safety: Accident Reporting and Records . . . . . AR 385-40

3. Publications Indexes

The following publications indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings. . . . . DA Pam 108-1
Militarv publications:
- Index-of Administrative Publications. . . . . DA Pam 310-1
- Index of Blank Forms . . . . . DA Pam 310-2
- Index of Graphic Training Aids and Devices . . . . . DA Pam 310-5
- Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders. . . . . DA Pam 310-4
- Index of Training Publications . . . . . DA Pam 310-3

4. Field Manuals

Explosives and Demolition . . . . . FM 5-25
Ordnance Direct Service Report . . . . . FM 9-3
Ordnance Ammunition Service. . . . . FM 9-5
Military Training . . . . . FM 21-5
Techniques of Military Instructions. . . . . FM 21-6

5. Forms

The following forms pertain to this materiel:
DA Form 468, Unsatisfactory Equipment Report.
DA Form 1115, Property Turn/In Tag (tag),
DA Form 2028, Recommended Changes to DA Technical Manual Parts List or Supply Manual 7, 8, or 9 (cut sheet).
DD Form 6, Report of Damaged or Improper Shipment (cut sheet).
DD Form 250, Materiel Inspection and Receiving Report.
DD Form 1149, Requisition and Invoice/Shipping Document (cut sheet).
DD Form 1348, DOD Single Line Item Requisition System Document (Manual).

6. Other Publications

a. General.
Dictionary of United States Army Terms . . . . . AR 320-5-1
Military Symbols . . . . . FM 21-30/AFM 55-3
Military Terms, Abbreviations, and Symbols: Authorized . . . , . . AR 320-5 Abbreviations and Brevity Codes.
The Army Equipment Record System and Procedures. . . . . TM 38-750
b. Cleaning.
Cleaning Compound, Alkali Type. P-C-436
Cleaning Compound, Solvent and Self-Emulsifying MIL-S-11090
Cleaning Compound, Synthetic Detergent, Nonabrasive, ... P-C-431 All-Purpose.
General Packing Instructions for Ordnance General Supplies . . . . TM 9-200
Material Used for Cleaning, Preserving, Abrading, and . . . . . TM 9-247 Cementing Ordnance Materiel; and Related Materials Including Chemicals.
Rag, Wiping, Cotton, Sterilized, Undyed, Class 1 or 2 . . . . . DDD-R-30
Solvent, Dry Cleaning.....,.. . . . . P-S-661
c. Paint Remover.
Remover, Paint (alkali type) TT-R-230
Remover, Paint and Varnish (Alkali Organic-Solvent Type) MIL-R-12294
d. Painting.
Enamel, Gloss, Synthetic (for Exterior and Interior Surfaces) . . . TT-E-489
Painting Instructions for Field Use . . . . . TM 9-213
Primer Coating, Synthetic, Rust Inhibiting, Lacquer-Resisting. . . TT-P-664
e. Packaging
Barrier Material, Paper, Noncorrosive MIL-B-130
Barrier Material, Water Vaporproof, Flexible MIL-B-131
Boxes, Fiber PPP-B-636
Cushioning Material, Cellulosic PPP-C-843
Desiccants, Activated, Bagged, Packaging Use and. . . . . MIL-D-3464 Static Dehumidification.
Tape, Pressure Sensitive Adhesive, Paper, Water-Resistant PPP-T-76
f. Shipping and Storage.
National Motor Freight Classification Rules and Container Specifications for Truck Shipments.
Protection of Ordnance General Supplies in Open Storage . . . . . TM 9-244
Uniform Freight Classification Rules and Container Specifications for Rail Shipments.

APPENDIX II

BASIC ISSUE ITEMS LIST

Section I. PREFACE

1. General

This appendix is a list of basic issue list items. It is composed of those items which make up the major end items of equipment and the first echelon tools, supplies, assemblies, and repair parts that are issued with the equipment and are required for stockage.

2. Requisition Notes

See appendix IV, paragraph 2.

3. Explanation of Columns

a. Source, Maintenance, and Recoverability Code (Col. 1).

(1) *Material numerical codes (col. 1a).* This column indicates the responsible commodity command for the materiel. The commodity command responsible for supply of items in this list are:

Code	Type Materiel
9	Ordnance Materiel

(2) *Source (col. lb).* This column indicates the selection status and source for the listed item. Source codes used in this list are:

Code	Explanation
C	Obtain through local procurement. If not obtainable from local procurement, requisition through normal supply channels with a supporting statement of nonavailability from local procurement.

(3) *Maintenance level (col. 1c).* This column indicates the lowest maintenance echelon authorized to install the listed item. Maintenance level codes used in this list are:

Code	Explanation
O	Organizational maintenance (lst and 2d echelon).

(4) *Recoverability (col. 1d).* This column indicates whether unserviceable items should be returned for recovery or salvage. When no code is indicated, the item will be considered expendable. Recoverability codes used in this list are:

Code	Explanation
R	Items which are economically repairable at field maintenance activities (3d and 4th echelon) and are normally furnished by supply on an exchange basis.

b. Federal Stock Number (Col. 2). This column indicates the Federal stock number which has been assigned by the Cataloging Division, Defense Logistics Services Center.

c. Description (Col. 3). This column indicates the Federal item name (shown in capital letters) and any additional description required for supply operations. The manufacturer's code and part number is also included for reference.

Code	Explanation
05083	Bacharach Industrial Instrument Company

d. Unit of Issue (Col. 4). This column indicates the quantity to be requisitioned.

e. *Quantify Authorized (Col. 5).* This column indicates the quantity of the listed item authorized for stockage to constitute the prescribed load.

f. Illustration (Col.. 6). This column indicates the figure number of the illustration that depicts the listed item. When more than one item appears on an illustration, the item number is also indicated.

4. Special Information

Repair parts and special tools required for organizational maintenance of the nozzle tester are listed in appendix IV of this manual.

5. Abbreviations

Abbreviation	Explanation
dwg	drawing(s)
ea	each
no.	number(s)
Ord	Ordinance

6. Suggestions and Recommendations

The direct reporting of errors, omissions and recommendations for improving this technical manual by the individual user, is authorized and encouraged, DA Form 2028 will be used for reporting these improvements. This form may be completed using pencil, pen or typewriter. DA Form 2028 will be completed in triplicate and forwarded by the individual using the manual. The original and one copy will be forwarded direct to:

Commanding General
Headquarters, U. S. Army Weapons Command
ATTN: AMSWE-SMM-TE
Rock Island Arsenal
Rock Island, Illinois, 61202

One information copy will be provided to the individual's immediate supervisor (e.g., officer, noncommissioned officer, supervisor, etc.).

Section II. BASIC ISSUE ITEMS

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6) Illustration	
(a) Material code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock No.	Description	Unit of issue	Quantity authorized	(a) Figure No.	(b) Item No.
					MAJOR COMBINATION				
9	----		R	4910-255-8641	TESTER, DIESEL FUEL INJECTOR NOZZLE: (05083 :YFL).	ea	----	1	-
					COMPONENTS OF MAJOR COMBINATION				
					None authorized.				
					REPAIR PARTS				
					None authorized.				
					TOOLS AND EQUIPMENT:				
					TOOLS				
					None authorized.				
					EQUIPMENT				
9	C	O	----	----------	CASE, CARRYING: (05083:65-808) --------	ea	1	5	1
9	C	O	----	----------	CUP, COLLECTOR: (05083 :65-317) ------	ea	1	5	2
9	C	O	----	----------	HOSE , PRESSURE, HIGH: (05083 :65-284) --	ea	1	5	3
					The following equipment used in conjunction with the nozzle tester is to be requisitioned on an "as required" basis. (FSN's 4910-955-5517 and 4910-955-5516)				
9	C	O	----	4910-955-5517	CONNECTOR SET, FUEL INJECTOR: (05083:65-275)(see applicable TM's).	set	1	6	1
9	C	O	----	4910-955-5516	CONNECTOR SET, FUEL INJECTOR: (Ord dwg no. B11020498)(for LDS-427 and 1790 series Continental Engines and others. See applicable TM's).	set	1	6	2

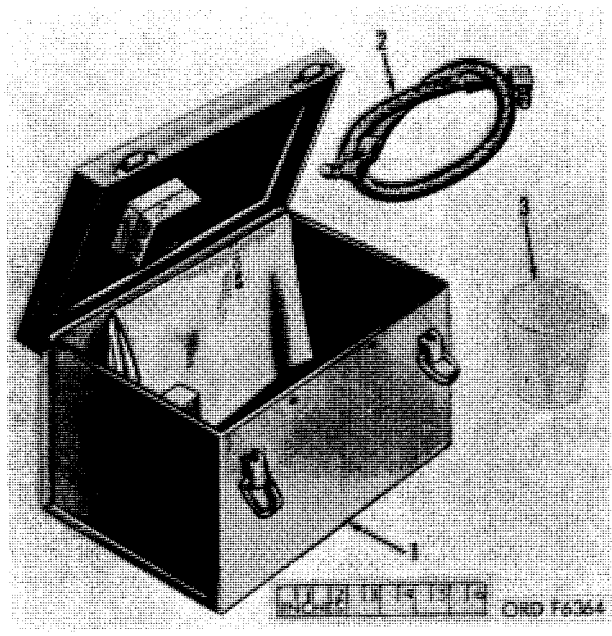


Figure 5. Equipment

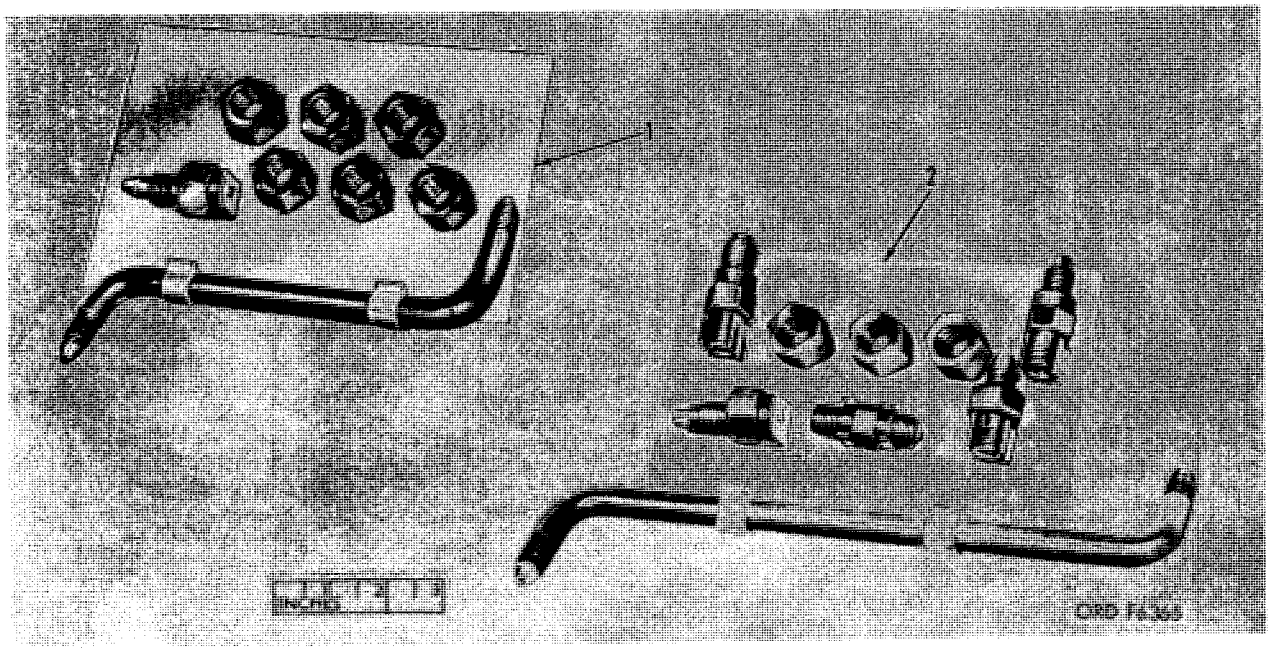


Figure 6. Equipment

APPENDIX III

MAINTENANCE ALLOCATION CHART

1. Purpose

The maintenance allocation chart allocates specific maintenance operation to the proper level.

2. Basis

Allocation of maintenance operations is made on the basis of time, tools, and skills normally available to the various echelons in a combat situation and influenced by maintenance policy and sound maintenance practices as outlined in AR 750-5.

3. Explanation and Definitions

The maintenance allocation chart designates overall responsibility for the maintenance function of an end item or assembly. Repair and/or rebuild of major assemblies is designated by authority of the Army Commander representative, except for the specific subfunctions listed in the maintenance allocation chart. Deviations from maintenance operations allocated to the maintenance allocation chart is authorized only upon approval by the Army Commander representative.

SERVICE	To clean, to preserve, and to replenish fuel and lubricants.
ADJUST	To prevent or correct malfunction by maintaining prescribed limits or by bringing into proper or exact position.
INSPECT	To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.
TEST	To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.
REPLACE	To substitute serviceable assemblies, sub-assemblies, and parts for unserviceable components.
REPAIR	To restore to a serviceable condition by replacing unserviceable parts, or by any other action required; utilizing tools, equipment, and skills available to include welding, riveting, straightening, adjusting, etc.
REBUILD	To restore to a condition comparable to new by disassembling the item to determine the condition of each of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, sub-assemblies, and parts.
SYMBOL X	The symbol X placed in the appropriate column indicates the echelon responsible for performing that particular maintenance operation but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

Maintenance Allocation Chart for Tester, Diesel Fuel Injector Nozzle

(1) Grp No.	(2) Component and Related Operations	(3) 1st	(4) 2nd	(5) 3rd	(6) 4th	(7) 5th
1	Tester, Nozzle:					
	Service	x				
	Adjust	x				
	Inspect	x				
	Test	x				
	Repair		x			
2	Body and Plunger Assembly					
	Service	x				
	Inspect	x				
	Repair			x		
	Rebuild (Plunger Assembly)					x
3	Discharge Block Assembly					
	Service	x				
	Inspect	x				
	Repair		x			
4	Fuel Reservoir Assembly					
	Service	x				
	Inspect	x				
	Repair		x			
5	Hydraulic Pressure Gage					
	Service	x				
	Inspect	x				
	Repair		x			

APPENDIX IV

REPAIR PARTS AND SPECIAL TOOL LISTS

Section I PREFACE

1. General

a. This appendix is a list of repair parts which may be required by the using organization for performing organizational maintenance but are not authorized to be stocked. These items are to be requisitioned as required for immediate use only.

b. For prices of items of Ordnance materiel, see the appropriate supply manual of the SM 9-2 series. Prices of items that are the responsibility of other commodity commands may be obtained from the appropriate type 2 supply manuals for those commands.

c. Additional applications of items in this manual are listed in the supply manuals of the SM 9-3 series.

2. Requisition Notes

a. *Repair Part Identified by Federal Stock Number.*

(1) If the exact item requisitioned is not furnished, or if other action is necessary, the exact nature of the action taken by the commodity command will be indicated by standard symbols on prescribed forms.

(2) When requisitioning an item, the requesting agency will order the *listed* item. However, the commodity command will take necessary action to issue the exhaust stock item until stock is exhausted, whether it be an individual item, kit, set, or assembly.

(3) Requisition for replacement of items that are the responsibility of commodity commands will be submitted to the commodity command indicated in column 1a, Materiel Code Number.

b. Part to which FSN has not been assigned. When requisitioning a C source (local procurement) item identified only by a manufacturer's part number, it is mandatory that the following information be furnished the supply officer:

(1) Manufacturer's code number (5 digit number preceding the colon in the descriptive column).

(2) Manufacturer's part number (the number, and sometimes letters, following the colon, (1) above). Dashes, commas, or other marks must be included exactly as listed.

(3) Noun name and dimensions, if necessary.

(4) Name of manufacturer of end item (from cover of TM or manufacturer's name plate).

(5) Federal stock number of end item (from TM).

(6) Manufacturer's model n umber (from TM or name/data plate, preferably name/data plate).

(7) Manufacturer's serial number (from name/data plate).

(8) Any other information such as type, frame number, and electrical characteristics, if applicable.

(9) If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50. Complete form as follows:

(a) In blocks 4, 5, and 6, list manufacturer's code, and manufacturer's part number (as listed in description column).

(b) In Remarks field, list noun name (repair part), end item application (FSN of end item), manufacturer, model number (end item), serial number (end item), and any other pertinent information such as frame number, type, etc.

3. Explanation of Columns

a. Source, Maintenance, and Recoverability Code (Col. 1).

(1) *Materiel Numerical Codes (col. 1a).* This column indicates the responsibility commodity command for the materiel. The commodity command responsible for supply of items in this list are:

Code	*Type* materiel
3	Chemical Materiel
5	Engineers Materiel
9	Ordnance Materiel
10	Quartermaster Materiel

(2) *Source (col. 1b).* This column indicates the selection status and source for the listed item. Source codes used in this list are:

Code	Explanation
C	Obtain through local procurement. If not obtainable from local procurement, requisition through normal supply channels with a supporting statement of nonavailability from local procurement,

(3) *Maintenance level (col. 1c).* This column indicates the maintenance echelon authorized to install the listed item. Maintenance level codes used in this list are:

Code	*Explanation*
O	Organizational maintenance (lst and 2d echelon).

(4) *Recoverability (col. 1d).* This column indicates whether unserviceable items should be returned for recovery or salvage. When no code is indicated, the item will be considered expendable.

b. Federal Stock Number {Col. 2). This column indicates the Federal stock number which has been assigned by the Cataloging Division, Defense Logistics Services Center.

c. Description (Col. 3). This column indicates the Federal item name (shown in capital letters) and any additional description required for supply operations. The manufacturer's code and part number is also included for reference.

Code	*Explanation*
05083	Bacharach Industrial Instrument Company

d. Unit of Issue (Col. 4). This column indicates the quantity to be requisitioned.

e. Quantity Incorporated in Unit (Col. 5). This column indicates the total number of times the listed item is used in the end item (major item) or major combination. Where no quantity is shown, reference should be made to the first appearance of the item as indicated in the "description" column.

f. 15-Day Maintenance Allowance (Col. 6). This column indicates the quantitative allowance for second echelon of the listed items. These allowances represent one prescribed load, for a 15-day period, for the number of major items supported. They must be on hand or on order at all times. Major commanders will determine the number of prescribed loads second echelon units will carry. Units and organizations authorized additional prescribed loads will multiply the number of equipments supported by the number of prescribed loads. Additional repair parts which may be required for performing authorized maintenance, but are not authorized for stockage in the prescribed load, are indicated by an asterisk (*). These items are to be requisitioned as required for immediate use only. Where no quantity is shown, reference should be made to the first appearance of the item as indicated in the "description" column.

Note. The 15-day level is not applicable to special tools for organizational maintenance.

g. *Illustration (Col. 7).* This column indicates the figure number of the illustration that depicts the listed item. When more than one item appears on an illustration, the item number is also indicated.

4. Special Information

Basic issue items are listed in appendix II of this manual.

5. Abbreviations and Symbols

a. Abbreviations.

Abbreviation	Explanation
assy	assembly
cntr	container
deg	degree(s)
dr	drum

Abbreviation	*Explanation*
ea.	each
F	Fahrenheit
Fed	Federal
fl	flat
ga	gage
gal	gallon(s)
hex	hexagon
hr	hour(s)
in.	inch(es)
lb	pound
lg	length (long)
it	lightweight)
max.	maximum
ML	military
min	minute
mtl	metal
no.	number
od.	outside diameter
oz. ,	ounce(s)
pt	point
qt	quart(s)
ro	roll
sq.	square
thk	thickness)
w	wide, width
w/	with
ye	yard(s)

b. Symbols.

Symbols	*Explanation*
≠	as required
*	see par. 3f

6. Suggestions and Recommendations

The direct reporting of errors, omissions and recommendations for improving this technical manual by the individual user, is authorized and encouraged. DA Form 2028 will recompleted in triplicate and forwarded by the individual using this manual. The original and one copy will be forwarded direct to:

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ATTN: AMSWE-SMM-TE
Rock Island Arsenal
Rock Island, Illinois, 61202

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Section II. REPAIR PARTS AND SPECIAL TOOLS

(1) Source, maintenance, and recoverability code				(2)		(4)	(5)	(6)	(7) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock No.	Description	Unit of issue	Quantity incorporated in unit	Depot maintenance allowance per 1-6 requirements	(a) Figure No.	(b) Item No.
					REPAIR PARTS FOR:					
					Discharge Block and Hydraulic Pressure Gage Groups					
9	C	O	---	----------	BLOCK, DISCHARGE: assy (05083:65-949).	ea	1	*	4	2
9	C	O	---	----------	BLOCK, SUB, DISCHARGE: assy (05083:65-561).	ea	1	*	4	2F
9	C	O	---	----------	GASKET, GAUGE, VALVE: (05083:65-505).	ea	1	*	4	2G
9	C	O	---	----------	GASKET, VALVE, DISC HARGE: (05083:65-507).	ea	2	*	4	2A
9	C	O	---	----------	PACKING, PREFORMED: (O-RING) valve, discharge (05083:65-550).	ea	1	*	4	2D
9	C	O	---	----------	ROD, FILLER: assy (05083:65-803).	ea	1	*	4	2B
9	C	O	---	----------	SEAT, VALVE, DISCHARGE: (05083:65-358).	ea	1	*	4	2C
9	C	O	---	----------	VALVE, GAUGE: assy (05083:65-553).	ea	1	*	4	2H
9	C	O	---		GAUGE, PRESSURE, HYDRAULIC: (05083:65-534).	ea	1	*	4	1
					The following parts are not authorized for replacement by organizational maintenance.					
					2E - Cap nut assembly (05083:65-582)					
					2J - Valve handle (05083:65-622)					
					Fuel Reservoir and Body and Plunger Groups					
9	C	O	---	----------	FUEL RESERVOIR: assy (05083:65-947).	ea	1	*	3	2
9	C	O	---	----------	COVER, RESERVOIR, FUEL: (05083:65-787).	ea	1	*	3	2J
9	C	O	---	----------	FILTER, FUEL: (05083:65-788) ----	ea	1	*	3	2D
9	C	O	---	----------	GASKET, FILTER: (05083:65-761) --	ea	2	*	3	2C
9	C	O	---	----------	PACKING, PREFORMED: (O-RING) rod, center (05083:65-790).	ea	1	*	3	2H
9	C	O	---	----------	RESERVOIR, FUEL: (05083:65-786).	ea	1	*	3	2B
9	C	O	---	----------	ROD, CENTER: assy (05083:65-789)	ea	1	*	3	2G
9	C	O	---	----------	SEAL, RESERVOIR TO BODY, FUEL: (05083:65-797).	ea	1	*	3	2A
9	C	O	---	----------	SPRING, FILTER: (05083:65-791)---	ea	1	*	3	2F
9	C	O	---	----------	WASHER, FILTER: (05083:65-759)--	ea	1	*	3	2E
9	C	O	---	----------	HANDLE, PUMP: assy (05083:65-802)	ea	1	*	3	1B
					The following parts are not authorized for replacement by organizational maintenance.					
					1 - Plunger and body assembly (05083:65-948).					
					1A- Plunger and body					
					3 - Discharge block assembly and hydraulic pressure gage (Note: See Figure 4)					

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Technical service No.	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock No.	Description	Unit of issue	Quantity incorporated in unit	12-day maintenance allowance per 100 equipments	(a) Figure No.	(b) Item No.
					REPAIR PARTS FOR – Continued Fuel Reservoir and Body and Plunger Groups – Continued 4 - Socket head cap screw (05083: 65-508). SPECIAL TOOLS None authorized. TOOLS AND EQUIPMENT: TOOLS None authorized. EQUIPMENT Appendix II of this manual contains list of equipment required for operational and organizational maintenance.					

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Material code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock No.	Description	Unit of issue	Quantity incorporated in unit	10-day maintenance allowance per 1-6 requirements	(a) Figure No	(b) Item No.
					CLEANING, PRESERVING AND PACKAGING MATERIALS					
					ANTISTATIC AND CLEANER COMPOUND: petroleum base, liquid form, colorless, transparent, MIL-C-12156					
3	----	----	----	6850-368-5227	5 oz can	1	≠			
					BARRIER MATERIAL, WATER-VAPORPROOFED, FLEXIBLE: MIL-B-131. Glass Length, Yards Width, Inches					
10	----	----	----	8135-282-0565	1 200 36	1	≠			
5	----	----	----	8020-545-8517	BRUSH, PAINT: fl, hog bristle, w/ sq edge, 1-7/16 w, 9/16 thk, 1-3/4 exposed lg.	1	≠			
					CLEANING COMPOUND, SOLVENT: alkali type, Fed P-C-436a.					
9	----	----	----	6850-598-3057	35 lb pail	1	≠			
9	----	----	----	6850-224-6661	100 lb pail	1	≠			
					CLEANING COMPOUND, SOLVENT: self-emulsifying MIL-S-11090.					
9	----	----	----	6850-224-6665	5 gal cntr	1	≠			
9	----	----	----	6850-224-6666	55 gal dr	1	≠			
					CUSHIONING MATERIAL, PACKAGING: cellulose wadding (non-bound), type III, class B, water-resistant, roll Fed PPP-C-843. Length, Feet / Width, Inches / Thickness					
10	----	----	----	8135-558-0823	66 20 1.000	1	≠			
10	----	----	----	8135-183-8815	99 20 0.500	1	≠			
					DESICCANT, ACTIVATED: class 2 MIL-D-3464 Units per Bag / Bags per Container / Size of Container					
3	----	----	----	6850-264-6568	1/2 600 5 gal can	1	≠			
3	----	----	----	6850-264-6573	2 200 5 gal can	1	≠			
10	----	----	----	7930-249-8036	DETERGENT, PAINTED SURFACE: powdered, used for general cleaning, Fed P-C-431a, type I, 5 lb pail	1	≠			
					DRY CLEANING SOLVENT: liquid form, to remove soil from surfaces in dry cleaning process, petroleum distillate, 140 deg F flash pt, Fed P-S-661, type II.					
10	----	----	----	6850-281-1986	55 gal dr (16 ga)	1	≠			
10	----	----	----	6850-285-8011	55 gal dr (18 ga)	1	≠			
10	----	----	----	6850-637-6135	bulk	1	≠			
					ENAMEL: full gloss, 8 hr max air dry hard time, gray color no. 16187, Fed TT-E-489, class A.					
5	----	----	----	8010-298-2300	1 qt can	1	≠			
5	----	----	----	8010-286-7749	1 gal can	1	≠			
5	----	----	----	8010-286-7749	5 gal can	1	≠			

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Material code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock No.	Description	Unit of issue	Quantity incorporated in unit	15-Day maintenance allowance per 1-6 requirements	(a) Figure No.	(b) Item No.
					CLEANING, PRESERVING AND PACKAGING MATERIALS—Continued					
					FIBERBOARD, CORRUGATED: double face, class 3, grade 3 (V3c), Fed PPP-B-636.					
					Length, Inches Width, Inches					
10	----	----	----	8135-281-4112	84 36	1	≠			
10	----	----	----	8135-281-4113	120 36	1	≠			
10	----		----	8135-281-9067	96 48	1	≠			
10	----	----	----	8135-281-4115	96 60	1	≠			
					FIBERBOARD, CORRUGATED: double face, class 3, grade 5 (W5c) Fed PPP-B-636.					
					Length, Inches Width, Inches					
10	----	----	----	8135-281-4120	84 36	1	≠			
10	----	----	----	8135-281-4121	120 36	1	≠			
10	----	----	----	8135-281-5105	96 60	1	≠			
10	----	----	----	8135-281-5106	72 72	1	≠			
					PAPER, WRAPPING, LAMINATED AND CREPED: type I, MIL-B-130.					
					Length, Yards Width, Inches					
10	----	----	----	8135-664-0028	100 36	1	≠			
					PRIMER, COATING: 30 min max air drying time for recoating, Fed TT-P-664.					
5	----	----	----	8010-161-7274	1 gal can	1	≠			
5	----	----	----	8010-161-7275	5 gal can	1	≠			
					RAG, WIPING: cotton, sterilized, unbleached, white, designed for general purpose use, Fed DDD-R-30, class II.					
10	----	----	----	7920-234-8462	5 lb bag	1	≠			
10	----	----	----	7920-205-1711	50 lb bag	1	≠			
					REMOVER, PAINT: alkali-organic solvent, nonflammable, liquid, 50 gal in a 55 gal agitator dr, MIL-R-12294.					
9	----	----	----	8010-283-0511	5 gal cntr	1	≠			
5	----	----	----	8010-283-0511	55 gal dr	1	≠			
9	----	----	----	8010-227-1694	REMOVER, PAINT: alkali (nonferrous mtl) Fed TT-R-230, class II, 400 lb dr.	1	≠			
9	----	----	----	8010-227-1693	REMOVER, PAINT: alkali (ferrous mtl) Fed TT-R-230, class I, 400 lb dr.	1	≠			
					TAPE, PRESSURE SENSITIVE ADHESIVE: paper backing, water-resistant, natural, 120 yd roll Fed PPP-T-76					
					Width, Inches					
10	----	----	----	8135-297-6655	2	1	≠			
10	----	----	----	8135-297-6656	3	1	≠			
5	----	----	----	8010-242-2089	THINNER, PAINT, MINERAL SPIRITS: 340 deg F to 485 deg F distillation range, Fed TT-T-291a, lt type thinner, 1 gal can.	1	≠			

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NG: State AG (3).
USAR: None.
For explanation of abbreviations used, see AR 320-50.

TM 9-4910-409-12 OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS) TESTER, DIESEL FUEL INJECTOR NOZZLE (BACHARACH INDUSTRIAL INSTRUMENT COMPANY MODEL YFL) (4910-255-8641) WITH CONNECTOR SET 44 (BACHARACH PART NUMBER 65-275) (4910-955-5517) AND CONNECTOR SET (ORD DWG B11020498) (4910-955-5516)

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